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THE
Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.]

FRIDAY, MARCH 18, 1864.

[No. 591. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MARCH 23.—Passion week. *No meeting.*

MARCH 30.—“Artificial Light and Materials Used for Lighting.” By B. H. PAUL, Esq.

CANTOR LECTURES.

The concluding lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

Six lectures on “Chemistry applied to the Arts” will be delivered by Dr. F. CRACE CALVERT, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Impériale de Pharmacie de Paris, &c., on Thursday evenings, at 8 o'clock, as follows:—

MARCH 31.—LECTURE I.—BONES.—Composition of raw and boiled bones. The manufacture of superphosphate of lime. Application to agriculture. Bone-black or char, and their use in sugar refining. *Phosphorus*, its properties, extraction and employment in manufacture of matches. *Horn and ivory*, their composition and applications.

APRIL 7.—LECTURE II.—GELATINE, GLUE, BONE-SIZE CHONDRISE, their preparation, chemical properties, nutritive value, and application to arts and manufactures. Artificial tortoiseshell. *Isinglass*, its adulterations and adaptations to clarification of fluids. *Skins* and the art of tanning.

APRIL 14.—LECTURE III.—LEATHER.—The art of the currier. Morocco, Russia, and patent leathers. The art of tawing skins. Chamois and glove skins. Parchment. *Hair*, its composition and dyeing. *Wool*, its washing, scouring, bleaching, and dyeing. *Silk*, its adulterations and conditioning.

APRIL 21.—LECTURE IV.—ANIMAL FATTY MATTERS, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

APRIL 28.—LECTURE V.—FLESH, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash*. *Prussian blue*. Manufacture of artificial animal manures.

MAY 5.—LECTURE VI.—ANIMAL LIQUIDS.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition pro-

perties, falsification, and preservation. A few words on putrefaction.

DWELLINGS OF THE LABOURING CLASSES.

The Council have passed the following resolutions:—

“That a Conference of the Society be summoned to consider the causes of the present unsatisfactory condition of the Dwellings of the Labouring Classes, and what remedies can be advantageously adopted.”

“That, besides inviting the attendance of any members of the Society taking an interest in the subject, the co-operation of such as are members of the Legislature as well as of the Presidents of the Institutions in union, be especially requested.”

“That the Chairman of the Council, Lord Henry G. Lennox, M.P., Mr. Marsh, M.P., Mr. Cole, C.B., and Mr. C. Wren Hoskyns, be a committee to make the arrangements for the Conference, and to invite thereto any other persons whose presence they may think desirable.”

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGESS, Esq.

SIXTH LECTURE, MONDAY, MARCH 14.—FURNITURE.

The lecturer said, that under this very comprehensive title he would not confine himself to what is generally understood by furniture, but would enlarge upon the general decorations of the interior of our domestic buildings. He first of all called attention to the way in which this matter was arranged in the 13th and 14th centuries, showing from the extracts of the public records, published in “Parker's Domestic Architecture,” how the ceilings were boarded and painted; and how the walls afforded endless subjects for the invention of the artist, while the better sort of furniture was also historiated with colour and gold. Some curious extracts, from Guillaubert de Metz, and Vasari, were brought forward to show what were the domestic arrangements of the 15th century in France and Italy, the first extract being the description of a citizen's home in Paris in 1409, and the latter containing a long account of the works of Dello Delli, who was especially famous for his paintings on furniture. The next portion of the subject was the various modes in which articles of furniture could be ornamented. Thus, if the wood be made to show, it can be inlaid with marquetry, buhl, mother-of-pearl, ivory, or be partially covered with more valuable wood, or have ornaments in the metals, in marbles, and enamels. Again, when the wood is intended to be entirely covered, it can be decorated with various sorts of gilding, as in the coronation chair at Westminster; or have paintings in certain parts, as in the presses at Noyen and Bayeux; or it can be painted and

covered with varnish, like the Japanese work." The lecturer then observed that, although it was impossible for any one man to give the age a distinctive architecture or a new and picturesque costume, yet in his own house he could do completely as he liked, and if his rooms were furnished in bad taste the fault must rest with himself. A series of suggestions then followed for the decoration and furnishing of our rooms, great stress being laid upon the desirability of giving some sort of decoration to our flat white ceilings, and of substituting wall paintings for paperhangings. The practice of filling the windows with one immense piece of plate glass, thereby depriving the house of all scale on the outside, and giving the room a cold appearance from the inside, was also reprobated; and several suggestions put forward respecting the treatment of the floors, and of the furniture generally, moveable divans being recommended instead of the multiplicity of sofas and chairs. A few words on ecclesiastical decoration concluded the lecture, attention being especially called to the beautiful stalls at Amiens, and more particularly to the treatment of the moulding and carving. There were some very excellent specimens of furniture exhibited by the more prominent decorators and upholsterers. Thus, Mr. Crace contributed an oak cabinet, with a brass grille, designed by the late Mr. Pugin. Messrs. Trollope sent an ebony cabinet in the cinque-cento style; while several articles, more particularly a table in purple wood, were due to the courtesy of Messrs. Jackson and Graham. Mr. C. Seddon contributed an *escritoire* in oak, decorated with marquetry, from the designs of his brother, the well-known architect, besides several chairs; and Mr. Ellis, of Bedford-street, a curious example of the employment of natural foliage (ferns, &c.) in the decoration of panels. There were also one or two specimens of furniture painted after the manner of the thirteenth century by modern artists.

FOURTEENTH ORDINARY MEETING.

Wednesday, March 16th, 1864; G. F. Wilson, Esq., F.R.S., Member of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Nelson, Thomas James, Guildhall, E.C.
Parsey, Samuel, 77½, Little Britain, E.C.
Stanford, Edward C. C., 63, Lincoln's-inn-fields, W.C.

AND AS HONORARY CORRESPONDING MEMBER.
Romake, Joseph, Admiralty, Trieste.

The following candidates were balloted for and duly elected members of the Society:—

Benham, Edward, 18, Essex-street, Strand, W.C.
Boxell, Thomas, 43, King's-road, Brighton.
Greig, Robert, 33, The Cedars, Putney, S.W.
Martin, Claude, Park-cottage, Acton, W.
Parry, Robert Seaton, Balham Hill, Surrey, S.
Robinson, S., 60, Church-gate, Stockport.
Ruddock, Samuel, 22, Bloomfield-terrace, Pimlico, S.W.

The Paper read was—

ON THE ORGANISATION OF THE CORPS IMPERIAL DES PONTS-ET-CHAUSSÉES, IN FRANCE.

By GEORGE R. BURNELL, Esq., C.E., F.G.S.

As England is approaching the time when the services of the state are destined to be more or less centralised, it seems to me necessary for those who are charged with the superintendence of the various offices of the government to acquaint themselves with the principles upon which foreign nations have organised the bodies to whom they have entrusted the peculiar duties connected with the various branches of the administration. There is, too, a tendency on the part of some of our statesmen of the present day

to praise everything that emanates from the French government, particularly with respect to the administration of public works; and as the Corps Imperial des Ponts-et-Chaussées is the most important body that the Minister of Public Works employs upon them, it seemed to me that it would afford the subject of an evening's discussion that would be fraught with interest to you, were I to relate succinctly that which I know with respect to the organisation of that body, and of the education that the members of it are obliged to go through.

The public works of France constitute the object of a separate department of the administration of the country, under the control of a minister, who is responsible to the Emperor for the manner in which he discharges his duties. These consist of the maintenance and the perfection of the means of internal communication, both by land and water; the providing for the safety and convenience of the traffic with foreign countries, by the docks, river navigation, the lighthouses, and beacons of the coast; the works that are undertaken for the improvement of agriculture, such as draining and irrigation works, &c.; the mining operations (by the way, these operations are conducted under the superintendence of a special body of engineers, called the *Ingénieurs des Mines*, with respect to the organization of whom I read a paper at the meeting of the Royal Cornwall Polytechnic Society, in the month of September last); the conditions that are to be observed with regard to the exercise of unhealthy and dangerous trades; the working of steam engines; the erection and maintenance of the buildings of the state, beyond those that are comprised within the functions of the other ministers; but in many cases the *Ingénieurs des Ponts-et-Chaussées* enter into the service of the State under the different branches of the administration, as *en service détaché*. The Minister of Public Works has also to prepare and propose the laws for the regulation and control of private commerce; for the encouragement of arts, so far as they are affected by the processes of manufacture. He has the control of the industrial schools, the fund for the superannuation of government employés, the savings banks, the joint stock companies, the private banks, and the superintendence of the service of weights and measures. He is also charged with ascertaining the changes in foreign legislation on the subjects that are likely to interest French commerce, and it is his duty either to publish them, or to send them round to those that may be affected by them; according to the regulations that prevailed some time since, he had the superintendence of the general statistics of France, and of the government stations for breeding horses. In the discharge of these duties he is assisted by the *Ingénieurs des Ponts-et-Chaussées*, for all that relates to the services that come within their functions; thus there is a Direction of Roads and Bridges, that is charged with the service of the highways, and the departmental roads, and with the police of the traffic upon them. There is a Direction of Navigation, that is charged with the service of the ports and the canals, with the rivers, both navigable and floatable, understanding by the latter word such as are capable of floating down timber, but are not suited for navigation, either on account of their velocity, or their shallowness, or irregular volume; with the police of these rivers, and with the arrangements for their improvements. There is a Direction of Railroads, divided into two sections; of which the first undertakes the regulation of the lines and their concessions; and the second undertakes the works, and the direction of the working of the railroads, and the collection of the statistics of that means of locomotion. The Minister is assisted by the *Ingénieurs des Mines* in their department, but they are immediately under the orders of the *secrétaire-général* of that body; in the other branches of his duties the minister is assisted by a numerous staff of officers that relieve him of the care of the details, and allow him to concentrate his attention upon the broad principles involved in the policy he himself is disposed to carry into effect. It is probable that in the rapidly

changing system that now prevails in France, some portion of the duties that are above enumerated, as, for instance, the superintendence of the horse-breeding establishments, may be withdrawn from the functions of the Minister of Public Works, Agriculture, and Commerce; but the list given of the minister's duties was the correct one some time since, and it contains, at any rate, a correct statement of the functions that the French authorities considered to fall within the limits of that officer's occupations.

The Administration des Ponts-et-Chaussées, it is thus seen, forms one of the most important branches of the service of the Minister of Public Works, and is organised in the most systematic manner, according to the French point of view, to secure the effective discharge of the services entrusted to it. The date of the creation of this body is rather remote, and it is another illustration of the manner in which the *Ancien Régime* had prepared the way for the Revolution. As far back as the time of Henry IV. there existed, in fact, a government body of engineers, under the direction of the Grand Voyer of the Kingdom. Louis XIV. gradually increased the power of these engineers; and in 1722, the Regent instituted the Corps des Ponts-et-Chaussées, under its present name, and with nearly the same functions that it has at the present day, for the purpose of executing the system of public works that France had then determined upon. MM. Trudaine, father and son, were the heads of this organization, and they were succeeded by Perronet, in the direction of the Ecole des Ponts-et-Chaussées at any rate, about the year 1750; at the same time the local governments of Languedoc and Bretagne established their separate bodies of engineers, on the same footing as that of Paris for the rest of the kingdom. In 1791, the Constituent Assembly passed a decree, maintaining the organization of the Ponts-et-Chaussées, but they introduced into it the system of management that now prevails, and they only recognized one school for it, viz., of Paris. There have been some changes, without importance, since that period, as in the years 1804, 1817, 1836, 1839, 1853, 1855; but substantially the organization of the administration remains the same as it had been settled by the Constituent Assembly. The acts that have been referred to only made some alteration in the ministry that they were under, and a little difference in the authority of the sous-secrétaire d'état that was specially charged with the direction of the united bodies of the Ingénieurs des Mines, et des Ponts-et-Chaussées.

The minister, then, under the present system, approves the projects of the new works submitted to him in the regular course of his business, and those of the great repairs of the roads, bridges, canals, and harbours; he sees to the regularity of the contracts that are taken; he divides the credits allowed by the legislature; and he prepares the decrees regulating the position of the engineers from the 2nd class, observing in all cases the regular system of promotion, unless there be some very peculiar circumstances connected with the case. The directeur-général has the superintendence of the correspondence with the préfets of the various departments and the engineers; he presides over the meetings of the conseil-général in the absence of the minister; and he prepares all the details of administration that the minister is required to sign. The conseil-général is composed of the engineers of every degree that may be present at the time in Paris; it is presided over by the minister; in his absence, by the directeur-général, or by an inspecteur nominated for the purpose by the minister. It has to pronounce upon the projects and plans of works, and all the questions relating to construction that may arise; upon the questions of accounts, and upon those that concern the legal rights of the state, arising out of the property that it has in the works executed; and, finally, it decides the questions that are connected with the duties of the engineers, that would have to be brought before the council of state or the minister; for in France no

person in the employ of the government can be prosecuted for the acts that he may commit in the course of the discharge of his duty, however gross they may be, without the permission of the conseil d'état, before whom the actions that may arise must be tried.

The whole of France is divided into eighteen districts, each of which is under the inspection of an engineer, who receives the title of inspecteur-général de 2^{de} classe; the inspecteurs-généraux de 1^{re} classe being honorary members, and without any definite functions. The inspecteurs are obliged to visit their districts every year, for the space of three months, and they render an account to the conseil-général of the state in which they have found everything in the course of their visit, either with regard to the composition of the staff, the manner in which the accounts are kept, or the conditions they may observe to prevail in the works, such as the roads, bridges, rivers, canals, harbours, railways, factories, ferries, drainage operations, &c. This report must be prepared on paper that allows the engineers in charge of the various parts of the public works to append their remarks to it; or rather the latter have to make a report that is transmitted to the conseil, approved and commented upon by the inspecteur; the reports of the latter class of officers, however, that relate to the staff of engineers, are sent directly to the minister, on account of the confidential character of the communications. The service of the departments is divided between the ingénieur-en-chef de 1^{re} classe and the ingénieurs-en-chef de 2^{de} classe; the ingénieurs-ordinaire de 1^{re}, 2^{de}, et de 3^{me} classe; and the conducteurs faisant fonctions d'ingénieur-ordinaire, or of the various brigades of the officers of that rank. The ingénieur de 1^{re} classe is charged with the preparation of the projects for the improvement of his district; the demand for, and the opening of, credits; the execution of works either by competition or by régie, which means that the state employs the workmen and engages the tradesmen to furnish materials on its own account; the number of people employed in the offices; the payment of the accounts, and the delivery of the certificates and orders upon the treasury; the direction of the law proceedings; and the movement of the *employés* of the office. The ingénieur-ordinaire presents to the ingénieur-en-chef the accounts of the measurement of the works executed, and the various conditions of the reception, and the state of those works; he is also charged with the examination of the projects that it may be considered advisable to undertake, which are then submitted to the ingénieur-en-chef, and by him are transmitted to the ingénieur-inspecteur, to be by him co-ordinated with the general projects for the whole kingdom. The ingénieurs-ordinaires are likewise charged with the duty of following the inquiries before the local authorities, into the propriety of establishing certain trades in the localities, that may give rise to questions *de commodo et incommodo*, as the French style the questions that are connected with the establishment of unhealthy trades, and the regulation of the lines of buildings on the public roads; the police of the roadways is also within the jurisdiction of the ingénieurs-ordinaires, who are, however, obliged to conform to the orders they may receive from the higher authorities in these matters. It is the duty of the ingénieurs-ordinaires to see that the various contractors execute their engagements with the State in the strictest manner, and they must personally superintend the measurement of the various accounts they certify; they are assisted in the performance of their various duties by the conducteurs, who may, on some occasions, be promoted to the fulfilment of the office of ingénieur-ordinaire; but the rule of the promotion in the Corps des Ponts-et-Chaussées is very much opposed, as we shall see hereafter, to the irregularity of this movement of the last-mentioned body of men; they only are allowed to perform the functions of engineer, whilst they remain conducteurs to the end of their lives.

The ingénieurs des Ponts-et-Chaussées are admitted into that body in the following manner, that is never de-

parted from, let the candidate for distinction display ever so much knowledge that would become useful in the profession of a civil engineer. The candidate for admission must first of all prove himself capable of going through the examination of the Ecole Polytechnique, and if he support that ordeal, he must study in that school for the space of three years, passing through the examinations that the pupils of the école are subject to every year. He then, after going through another examination, proceeds to the special school of the Ponts-et-Chaussées, where he follows a course of education that is considered to be such as to qualify him to practise as a civil engineer. He has to go through various repetitions and preliminary examinations, that in their variety of subjects, and the profundity of the scientific information that they require, would sorely puzzle the English engineers in the majority of cases; and finally, at the end of three years, the candidate is allowed to pass the final reception, and to be classed as an aspirant-ingénieur, or an ingénieur de 3me classe. The pupils who go through the last examinations with particular distinction are sent abroad to study the peculiarities of foreign practice; and when they return their notes are published, for the most part, in the "Annales des Ponts-et-Chaussées." They are then sent with their colleagues to the various places that may be in want of an engineer; but their special talent is hardly considered in the choice of their pursuit, either in their first nomination or in their subsequent promotion, which follows the regular steps, and leaves little room for the display of original talent of any kind. The consequence of this organisation of the school is that the young men leave it with a vast amount of undigested knowledge that would enable them to pass the examinations in the various branches of their profession; but they rarely possess any practical knowledge whatever. "They are," as M. Etex said in his lectures "On the Fine Arts applied to Industry," "capable of anything and fit for nothing;" and the fact that their promotion in after-life depends upon the mere principle of their seniority, tends very much to perpetuate the sort of feeling which the pupils of the Ecole des Ponts-et-Chaussées have when they leave that institution. This may be said to be a perfect self-satisfaction with themselves, such as always accompanies the possession of theoretical, as contrasted with practical, knowledge, and a contempt for all who may not be so well acquainted with the class of information that they have been enabled to obtain; and there is this peculiar disadvantage attending the kind of preparation for the future exercise of their profession that the young men who leave the Ecole des Ponts-et-Chaussées are exposed to, that they are obliged to rely greatly upon the conducteurs of that body for all that may relate to the practical details of the pursuit.

When the Ecole des Ponts-et-Chaussées was first instituted, in 1747, by M. Trudaine, on its present footing, and Perronet was appointed director of it, the class of education was more general and more decidedly practical than it is now; and the consequence of this was that the productions of the first engineers of the Ponts-et-Chaussées were characterised by much greater taste than those of their successors. It happens in France, and has been observed to take place in England, that the new inventions and the new processes that are introduced into the building trade are all of them of a nature to require the knowledge by those who employ them, of the powers of resistance of materials; and as architects are seldom disposed to study the scientific part of their profession (which would be required in the case of these new processes), it follows that the engineers are always consulted when they are to be employed. The inconvenience of the course followed in the education of young engineers is beginning to be felt in the supreme ugliness that they give to the monuments they are called upon to design; and there are serious questions whether it would not be worth while to change the system of education, in order to introduce some principles of taste, such as had marked the produc-

tions of the earlier engineers. Perhaps this might be effected, if the knowledge of free-hand drawing from the figure were made an essential part of the course of examination, and proof were required of the attendance of the pupils at courses of lectures in architecture and archaeology; but this is at any rate certain, that the engineers of the Ponts-et-Chaussées invariably spoil the opportunities that are afforded them to erect civil buildings, and that the various bridges that they are employed to execute are very deficient in the monumental grandeur that characterized the productions of Huppeau, Pitrou, Perronet, Chezy, Lamblardie, De Prony, &c. This is, after all, a question that interests the lovers of aesthetics, and may for the time be set aside, the more especially as the tendency of everything that is happening in England and America is towards the same state of indifference to the effect of the great works entrusted to the engineers; provided the works satisfy the conditions of stability that are required in them, the public seems contented to set aside the consideration of their beauty in France as well as in England; and the accusation against the engineers of the Ponts-et-Chaussées, that their productions are deficient in taste, must, at any rate, be shared by their colleagues in other countries that pretend to as high a state of civilization as France.

The engineers, however, after leaving the school, are sent, as was said, to the place that may be vacant, whatever the nature of the occupation may be there; they are then promoted, as was before said, in the order of their seniority, unless there be some very strong grounds for making an exception for or against them. They are expected to observe towards one another the kind of respect that is always observed in a military organization, and to exact the same respect from their subordinates; so that the conducteurs are always treated with the same kind of distance with which an officer would treat a common soldier. There are three kinds of service—the service ordinaire, the service extraordinaire, and the service détaché. Of these, the service ordinaire comprehends three classes—the service général, that includes all the ordinary kinds of works that fall within the duties of the Ponts-et-Chaussées; the service spécial, that embraces the direction of the works that are separated from the state budget, and are paid for by the departments; and the service des conseils généraux, that comprehends the general administration of the body, and the service of the Ecole des Ponts-et-Chaussées, and of the dépôt of maps and plans. The service extraordinaire includes the superintendence of various works that are paid for by the state, but do not enter into the ordinary occupations of the engineers; such as the service of the lighthouses, the works against inundations, the reclamation of the Sologne, &c.; whilst the service détaché comprehends the works that are executed for the departments of the state that are not included in the budget of the Minister of Public Works; such as the harbours of Brest, Cherbourg, L'Orient, Rochefort, Toulon, the colonies, the expeditions to foreign countries, Algeria, and the municipal service of Paris, Lyons, and other large towns. The salaries paid to the various grades are—for the inspecteurs-généraux de 1re classe, 12,000 francs per annum; of the 2nde classe, 10,000 francs per annum; ingénieurs-en-chef de 1re classe, 6,000 or 5,000 francs per annum; of the 2nde classe, 4,500 francs per annum; ingénieurs-ordinaires de 1re classe, 3,000 francs per annum; ditto of 2nde classe, 2,500 francs per annum; ditto of 3me classe, 1,800 francs per annum; the pupils of the Ecole des Ponts-et-Chaussées receive 1,200 francs per annum, and when they are employed on mission they receive 1,800 francs. The engineers are, besides their salary, entitled to charge their office expenses, which are fixed by the minister; but, with this exception, and the exception of some works that the engineers are allowed to undertake for the account of the communes, they are strictly limited to the appointments allowed them by the government. I can myself vouch for the fact that the engineers, notwithstanding the

moderate amounts of these salaries, are almost universally pure and honest, in the noblest degree; they scorn to receive bribes; and the tone of morals that prevails amongst them in all that relates to pecuniary affairs might serve as a useful lesson to ourselves. This is, perhaps, aided by the conviction that they cannot be discharged from their functions, or debarred from their promotion, unless under very peculiar circumstances of misconduct. They have also a retiring pension in their old age, and their position in society is about the highest in the French administration, from the esteem and respect that always attaches itself to the possession of the class of knowledge that they must attain. The influence of the money-making tendency of the age may be detected, perhaps, in some cases, but generally speaking, every one that has had occasion to know the ingénieurs des Ponts-et-Chaussées must bear the highest testimony to their profound sense of honour and delicacy of feeling.

One great cause of the efficiency of the service of the engineers is, however, to be found in the body of conducteurs, or clerks of the works whom they employ, and who are engaged upon the field operations, the superintendence of the workmen, the measurement of the works done, and the preparation of the drawings that are sent out from the engineer's office. The nomination of these men is rather singular, and takes place somewhat after this fashion:—The engineer receives a young man into his office, without salary at first, and he brings him up to the details of his business; at a certain time the men present themselves for examination as conducteurs, and they become embrigadés if they can pass that ordeal, which is made to embrace the whole range of sciences that are concerned with the practice of civil engineering, such as geometry, the theory of numbers, logarithms, the drawing of plans, levelling, taking out quantities, measuring work, the superintendence of it, and generally all that would be required for carrying works into effect. They become then conducteurs embrigadés de 4me classe, and they pass through the ranks of the third, second, and first classes, in the order of their seniority generally; but they may mount in grade more rapidly, in proportion to their merit or their patronage. By the law of 30th October, 1850, it was provided that the sixth of the places of the engineers should be reserved to the conducteurs that had been in the service for the space of ten years, and who could then pass the examination that the engineers were subjected to; but this provision has hitherto been perfectly nugatory, for since its promulgation there has not been a single promotion from the body of conducteurs. The utmost they can aspire to is to be allowed to perform the functions of a civil engineer, whilst they retain their old rank. They would be regarded as intruders if they forced themselves into the society of engineers, as the equals of the latter, by taking advantage of the letter of the law. The consequence of this state of affairs is, that the pupils of the Ecole Polytechnique have practically the monopoly of the government employment in the place of the Ponts-et-Chaussées, for the conducteurs do not aspire to that title, let them be ever so learned, or ever so capable; and thus the French revolution has perpetuated the inequality of conditions, by giving the monopoly of the profession to those that can afford to pay for the education that is given in the schools—a strange commentary upon the doctrines of equality that the revolution was intended to inaugurate.

There is a very great inconvenience arising from the strictly theoretical style of education that the young engineers are called upon to go through, that consists in the desire the bulk of them possess to distinguish themselves by the construction of works of a monumental character, without any regard to the conditions of economy that would be applicable in the majority of cases. The principle of the French law is that the architect is responsible for the solidity of the building that he may put up, against any defects of construction or erection, for the period of thirty years; and though the Ingénieurs

des Ponts-et-Chaussées do not come under the strict application of the law, owing to their not working for a commission, yet the tendency of the law is to produce a great degree of strength, and a solidity of execution, that may be traced in all the works they execute. The administration requires, in addition, that no work should fail; the engineer that risks much is looked upon as a dangerous and troublesome man. There is every inducement, therefore, for the engineer to erect "monuments," and the character of the works of the Ponts-et-Chaussées is marked with the grandeur and the magnificence *that was* formerly the distinguishing mark of the Roman engineers; but the cheap and expeditious systems that prevail in England and America are regarded with dislike and contempt. One other objection may be made to the French system, in the total absence of original thought that it develops. The best subjects, as they call them, are obliged every year to travel in foreign countries, and the works that are done in France are generally the productions of civil engineers and the somewhat despised race of architects. The Ingénieurs des Ponts-et-Chaussées do not attempt to produce any new style—they only seek to construct "monuments" that shall last for ever regardless of cost. The tendency of the body of the Ponts-et-Chaussées to this style of work is also, to a great extent, assisted by the publication of the journal of the body, that appears about six times a year, under the name of the "*Annales des Ponts-et-Chaussées*," and is characterised by the excessive love of theory, and the abuse (if I may say so much) of mathematical and other scientific knowledge, that may be reproached to the whole of the present school of French engineers. The members of that profession who communicate the information that is inserted in this journal, are, in fact, obliged to treat every subject which they undertake in the most abstract manner, as though they constructed or designed works for the sake of resolving problems of science, instead of endeavouring to answer the questions that might arise, with the purpose of constructing the works economically; they cultivate science as the end of their labours,—they do not look upon it as the means to the end. The same observation may be extended to the bulk of French scientific works, whether they be brought out by the Ingénieurs des Ponts-et-Chaussées or by the ingénieurs civils, for the latter are obliged to follow the example set by their rivals, and to employ a great amount of science on the simplest operations of their pursuit. Yet there is a great advantage in thus substituting the indications of theory for the rule-of-thumb processes that are still too prevalent here; and the contrast that is presented between the French engineering journals and the English productions of the same kind, is but little to the credit of our scientific and practical men.

The ultimate consequence of the strict system of promotion that prevails in France is, that all that relates to the general direction of the public works of that country is obliged to be transacted through the body of the Ponts-et-Chaussées; and the civil engineers are there reduced to the rank of conductors of the industrial establishments, that are still allowed to be free from state control, although the civil engineers have proved themselves to be capable of directing the railways and other public works, with at least equal ability with their more fortunate rivals. The railways seemed, for a time, to be destined to form an exception to the general body of the works, for the late Mr. Locke and the English contractors were entrusted with the execution of the Paris and Havre and the Cherbourg lines; but it was found that the relations between the Minister of Public Works and the company were so numerous, and they comprehended so many questions which involved the rights of the Ponts-et-Chaussées to interfere with the working of the railways, that even upon these lines the government engineers have been employed. Indeed it is difficult to imagine any other course being long adopted in France; the whole service of that country is so despe-

rately centralised that the intervention of the State is felt in all things. Thus, the body of the Ponts-et-Chaussées, being always upon the spot, is necessarily employed in making the surveys for the lines of railway, roads, and canals, that may be thought necessary; and the organisation of that body provides it with ample means of carrying out the projects that it conceives. It may be that the nation gains in the unity of views that is thus produced, and that many cases of competing lines may thus be avoided; but this advantage seems to me dearly purchased, when it is only obtained by the annihilation of the private enterprise of the whole country, which is the inevitable result of the French system. It has been pretended that the estimates that are prepared by the French engineers are better and more trustworthy than those that are made by their English brethren, and that a contractor would be more inclined to risk his fortune on the French preliminary surveys and estimates; but if we set aside the greater facilities that the French engineers have for making their calculations for the works that they are employed upon, the superior correctness of their estimates in works that are at all out of the common run may be very much questioned; and certainly they design their works in a manner that English engineers would consider to be very extravagant, owing to the traditions that prevail in the body of the Ponts-et-Chaussées, who pride themselves rather upon not considering the commercial view of the question in their constructions. It is, however, to be observed that much of the merit that is thus due to the engineers of the government is owing to the admirable system upon which their accounts are kept; and the merit of the "comptabilité" that forms, so much and so justly, the boast of the engineers is, after all, due to the conducteurs, whom the regulations of the body consign to perpetual inferiority. The engineers, in fact, content themselves with the duty of organising the manner in which the estimates and the definite accounts are to be prepared; they leave all the details to be worked out by the conducteurs, who fill the position of the *Soodras* in the "hierarchy" in which their chiefs play the part of the *Brahmins*. There is much more truth than appears at first sight, in this comparison with the Indian social arrangement, for the classes that are thus formed in the French body politic are as strictly defined as those of India, and there is nearly as much difficulty in passing from one rank to another. The distinction between the *ingénieurs des Ponts-et-Chaussées* and the *conducteurs* is, however, a permanent and ineffaceable one, that will always be a standing reproach to the system that would prevent a man from rising by his own merits to the foremost ranks of his profession.

Yet, although I am myself fully aware of the inconveniences of the French system of organising the public works of that country; though I know the great expense that the nation is put to on account of the want of practical knowledge, and from the deficient technical education of the engineers that the government is obliged to employ, from the fact that no man can there rise from the ranks, let his merits be ever so great, and from the mania that the system fosters for constructing monuments that should last for ever; yet I have seen such confusion and such waste occasioned by the system that prevails in England, especially in the appointment of government officials in similar matters, that I should be almost inclined to prefer the French system of the Ponts-et-Chaussées to the ignorance and incompetence that prevail here in government offices. The engineers of the Ponts-et-Chaussées are thoroughly acquainted with the subjects they have to pronounce upon, and they all feel as though the reputation of their body were entrusted to their safe keeping; whilst in England the nomination of the engineers of the government is entirely regulated by favour and caprice. Fortunately, the influence of the authorities that are appointed by the state is very small in England, for we still retain so

much of the independence of habits and modes of thought that are the essential characteristics of local self-government, that the engineers named by the government can do little; but if the circumstances should change, and if the influence of the central government should be increased, it must become a serious question with us, whether the organization of the Ponts-et-Chaussées, that does not admit the nomination or the advancement of the favourites of the minister of the day, may not be the best that can be devised in the interest of the ratepayer. In a highly-centralized government, like that of France, the organization of the Ponts-et-Chaussées no doubt produces excellent results. It would be out of place here, as long as we retain our self-dependence and that love of true equality, that enables any man to rise according to his own merits; but it is the best system that has yet been thought of for securing the talent of the men and the independence of their judgment from the theories or the passions of the moment. There are several details in the organization of the service which might easily be altered (as, for instance, the fact that the engineers are only responsible for the acts that they may do in the discharge of their duty to the *Conseil d'Etat*, and the fact that the conducteurs cannot rise to the superior ranks of the profession), but, with these exceptions, there seems to be no reason why something like the organization of the Ponts-et-Chaussées should not answer very well with the gradual tendency to the development of centralization that is so manifestly gaining ground amongst ourselves. It would secure for the public at least the services of educated engineers, and put a stop to the curious nominations that we have sometimes witnessed in our public offices; added to which advantage would be the incidental one of raising the tone of the profession in matters connected with their own emoluments, which recent events have shown to be very low in England. Perhaps there is something that is opposed to the English notions of government in the existence of a body that is composed of officials, who are not in any way liable to the influence of the ministers of the day, either for their nomination or for their advancement, and there may be danger in thus creating a body that should have the control of the funds of the nation to the exclusion of the rest of their profession, and to the perpetual interference with the ingenuity of the great body of the public; but this is counter-balanced by the advantage of the absence of the influence of the minister. There is, of course, the disadvantage of having to do with a board of theoretical men, who are likely to insist upon the observance of the strict scientific conditions that they conceive to regulate their pursuit, as was the case with the *Ingénieurs des Ponts-et-Chaussées* in the matter of the rate of the inclines for railways, which they for a long time insisted should be made with an inclination of 1 in 200, when the English engineers had proved that they might be executed at 1 in 60 without inconvenience. This is a drawback that will always attend an organized body of such a nature; but there must be set against it the advantage that this body procures in controlling the action of the government in the details of the practical application of the science. The minister is, indeed, quite powerless in cases which strictly belong to the carrying out of works that may be ordered; the *Ingénieurs des Ponts-et-Chaussées* alone can regulate the manner in which they are to be executed. The fact that the Ministry of Public Works is a political appointment, and therefore is subject to the caprice of the parliamentary government, throws a great power into the hands of the Ponts-et-Chaussées, who are always in possession of the influence which they may derive from their position as distributors of government patronage, and as executing the works that the state may, through their advice, undertake; and this they have shown that they know how to use for securing their independence.

It is desirable here to mention that the course adopted

in the execution of public works in France is for the Minister of Public Works to submit to the legislature a project of law for their establishment, if they are of a nature to require a concession from the state, or to give rise to a large advance of public funds, or if they should require the application of the law of expropriation; in other cases, they may be the subject of simple ordinances, as in the case of municipal or departmental works. The projects for all of these undertakings must be accompanied by drawings, specifications, and estimates, which must be approved by the conseil that is specifically concerned in their execution, and they give rise to the production of a mass of papers and reports that are produced for them, and which are themselves perfectly bewildering. The worst of this method of entrusting the public works to the care of the state is that there is no security that they shall be finished if once begun, provided the state be in want of funds, or it should have been found advisable to appropriate them to other uses. This last contingency has, it may be observed, already happened in several remarkable cases. For instance, the breakwater of Cherbourg, which cost the total sum of £2,400,000, had been mounted by the simple interest of the money during the time that it was in hand, to the sum of £8,400,000. The cost of the canals had been just tripled by the interest that had accumulated upon the sums invested in them before they were inaugurated throughout their length. Besides this there is always the danger and difficulty of the works being executed in an official manner, that gives rise to the inconvenience of reports and reference to the various offices of the state, in case there should be any reason to change any of the details of the system that may have been agreed upon at the first conception of the scheme. All the questions must be decided in the Conseil des Ponts-et-Chaussées of Paris, and, setting aside for the moment the absence of local control that must thence ensue, there must be a tendency in that body to impose their own style of work and their own modes of thought. In the cases of the works that are conceded to large public companies it might be supposed that the administrations of the latter would have sufficient power and influence to reduce the interference of the body of the Ponts-et-Chaussées to their legitimate bounds, but in all the concessions hitherto given there is left so wide a margin for the action of this body that they are practically all-powerful. The works are to be executed to their satisfaction, and they have a control over the workmen, the materials employed, and the manner in which the work is executed, so that they can stop the companies at any stage of their progress. Hitherto the force of public opinion has kept the engineers within the bounds of what may be considered their duty. It remains to be seen what will be the effect of this system when it is applied to a country fully accustomed to centralization, and debarred from the control of a free press, such as France is at the present day. The tendency of what is now passing in that country is to introduce the control of the engineers independent of the ministers of the day; to establish the system of the monopoly of classes that is perpetuated by the necessity for the pupils passing through the Ecole Polytechnique; and by the exclusion of the conducteurs and the civil engineers, to concentrate the money and the patronage of the state entirely in the hands of the engineers of the Ponts-et-Chaussées. I think this must eventually prove to be a wrong policy, though it certainly tends to raise the character and position of the engineers; and that France will, sooner or later, find herself, in this respect, in the trammels of a system of castes that will effectually destroy all originality of thought and action.

DISCUSSION.

Mr. HAYWOOD (Engineer to the City Sewer Commission) said he did not gather from the paper that Mr. Burnell held any conclusive opinion as to whether the system in France was better than that in England, or the reverse. With a great deal Mr. Burnell had said he fully con-

curred, but the root of the whole question of the organization in this country of a corps corresponding to that of the Ponts-et-Chaussées lay in the political condition and habits of the people. Whether it would be desirable or not, there was little probability of its being done in our time. He must confess that being tolerably well acquainted with France and her institutions, he never went there without regretting that some system could not be established in this country by which more unity of action in engineering matters could be obtained, especially with regard to the metropolis; but he could not see any intermediate condition between the present local-government system and the institution of a corps somewhat similar to that of the Ponts-et-Chaussées. If that corps was tested by the grandeur of its works, it was far in advance of the English; on the other hand, if the results were tested by the activity of commercial enterprise, then the French system was far behind ours. They had then to choose between the two. With regard to the works of the engineers in France, his conclusion was that their aqueducts, docks, high roads, and canals, were laid out better than our own, and also that the workmanship in them was superior to ours. With regard to the originality of their works he did not feel he could give an opinion. As to their scientific investigations he was inclined to place a higher value upon them than Mr. Burnell had done. Undoubtedly the first series of engineering publications he was acquainted with was the *Annales des Ponts-et-Chaussées*. He knew nothing in this country approaching them, and they formed a scientific literature of which any nation might be proud. There was one thing he could fully endorse,—that was the very high tone of honour amongst the engineers themselves. Their official pay was exceedingly small, but he believed a body of men with a higher professional tone did not exist. They did not aim at acquiring large fortunes, inasmuch as scientific men generally got in France that which they could only obtain here by becoming wealthy—they got high honour and social position. He happened to be at the New Year's levée of the Emperor, and he then inquired what was the precedence of the Corps des Ponts-et-Chaussées on such an occasion. He was told that the engineers took rank before colonels in the army, which was an evidence that their standing was fully acknowledged. But that was not the case in this country. There were brilliant exceptions, such as Faraday, and some others who, although they never sought for wealth, were still so distinguished that they could not be overlooked; but the great mass of professional men in this country were generally measured by the depth of their pockets. That was why they struggled to make money as quickly as possible, because money was the passport into society. The engineers of the Ponts-et-Chaussées had an entirely different tone of feeling. He knew many of them personally, and could speak of them in the highest terms. There was one remark in the paper about the architects which struck him. He understood Mr. Burnell to state that they were responsible for what was called the well-designing of their work for a period of thirty years. The period was a long one, but he thought it would be a wholesome thing if some such rule were acknowledged in this country. It was true, a man was responsible for what he did, because, if he did not perform his duty, remedy might be had against him at law; but most persons would rather bear the loss than have recourse to the remedy. Then, again, the French system had its disadvantages. All those who practised as engineers in that country must have gone through the Ecole Polytechnique, and thus have been in some measure educated by the State, and so became naturally subject to State control. After all he felt that he could not say with certainty which system he preferred, there were so many elements involved in the question; but he would say he never went to France without coming back bitterly regretting that our present system did not, with our huge wealth and great commercial enterprise, produce results more worthy of the

nation. If a few remarks on a subject, now becoming one of great interest in this country, were not out of place, he would say a few words as to the system of subways formed in Paris, which would serve as an illustration of the great care with which such works were carried out in France. His remarks would apply to Paris, Lyons, and other large towns. In the whole of the internal arrangements of those towns the French were beating us hollow: they were building better houses, forming better thoroughfares, putting up better lamp-posts, giving more light, and in all arrangements which affected the health of the community they were considerably in advance of this country. With regard to the main sewers of Paris, they were built in a style of magnificence which might be expected from a body who were not limited as to expense. He was one of those who thought the public works of large cities ought to be monumental, and not merely for the present generation. Surely it was an unworthy feeling that it was sufficient to carry out works which would last our own time, and to leave posterity to take care of itself. That was part of the money-greed of the age; and in that respect our public works contrasted unfavourably with those of Paris. The large intercepting sewers of the French capital were made with footways on each side. Those along the Rue Rivoli and the Boulevard-Sebastopol were so large that a full-sized man could walk on the footway on either side with his hat on, so ample were the dimensions of these sewers. They were kept in a state of cleanliness that was surprising. The entrances were made highly ornamental, which he thought superfluous; the steps which led down to them were wide enough for two persons to descend side by side. A railway ran along the edge of each of the footways of the large sewers, and below that was the invert forming the sewer proper. An exceedingly well-devised apparatus travelled up and down this railway, and mechanical scrapers were used by which the bottom of the sewer was constantly cleaned. The whole of the gas and water pipes were covered with a black varnish or bituminous compound; it was true there were leakages, but very few. The smaller branch sewers were most of them six feet in height, and on each side of them might be seen porcelain figures marking the house drains, with a small piece of white enamel about an inch square, which indicated that the proprietor of a particular house paid three francs annually for keeping his private drain clear. Everything was carried out on the same scale. When they contrasted this with the way things were done in London, without entering into the political question, with which he had nothing to do, but looking simply at the material results as they were presented in the capital and large towns of France, it made us ashamed on looking at our own metropolis; and when one knew as much about the expenditure in London as he did, as compared with the wealth, he must come to the conclusion that there was no town in France in which the inhabitants relatively to their means spent so little in keeping their city in decent and proper order as they did in London.

Mr. E. C. TUFNELL remarked that the direction of the observations just made was altogether to depreciate English engineers below the French. He did not agree with that position, because there were many facts which went in contradiction of it. When the French desired to introduce any new engineering practice they almost invariably came to this country for the assistance of engineers. When railways were first commenced in France they sent for Locke and other English engineers to carry them out. We were the first country to introduce suspension-bridges. The French sent a deputation to this country from the Ecole Polytechnique to inspect what we had done; they returned to France, issued an elaborate report, stating that our suspension-bridges were erected upon wrong principles, and devising (as they thought) better ones. They erected a suspension-bridge in Paris on their principles, but immediately upon its completion it tumbled down. Then, again, with regard to the Suez Canal, notwithstanding the predominance of

French influence in Egypt, the Pacha sent to this country for engineering advice with regard to that project, and Mr. Hawkshaw went out to that country to make a professional report upon that great undertaking. Looking at these facts he could not at all reconcile them with the views expressed by Mr. Haywood.

Mr. FREDERIC LAWRENCE did not feel the same difficulty that Mr. Haywood felt, as to which system he preferred. As an Englishman he approved of a system which allowed talent to develop itself—by itself—rather than a centralised system which tended to cramp the energies and fetter the originality of those employed; and he thought if they compared the engineering works of this country with those of France, looking at the works themselves, they would see at once that our system was by far the best. Could the French engineers point to a Britannia Bridge? or if they had anything resembling it did they not copy it from us? Was not every large engineering work in France a copy or modification of something previously done in England? He was surprised to hear Mr. Haywood speak so approvingly of the sewers of Paris. It might be that the sewer along the Rue Rivoli was better than anything we have in London, but why was it better? Because the French engineers came over here and saw what we had done: they adopted what we had done well, and improved where they felt they could improve. It was, however, only recently that sewers had been introduced into Paris, and if that system were carried out all over the capital—as was stated regardless of expense—Paris might eventually be a better drained city than we could boast of. With regard to some of the details, he did not think Mr. Haywood, with whatever staff he could command, would care to have put upon him the task of fixing up the tablets he had spoken of, in the city sewers, indicating the numbers of the drains, and the sum paid by each private individual to have his drain kept clean. He had no hesitation in saying that, in his opinion, however admirable an institution the Corps of Pont-et-Chaussées of France was, it bore no comparison with the engineers of England; because, when he looked round, he saw the names of engineers who had carried out works which the Corps of Pont-et-Chaussées dared not have attempted. He therefore differed from Mr. Haywood, and had no hesitation in pronouncing the English engineers the first in the world; for, when any country was in difficulty, England was applied to for that valuable engineering counsel which could be obtained from no other country.

Mr. HAYWOOD explained that his remarks had been misunderstood. He had dealt only with the broad features of the paper, and he had made no comparison between English and French engineers, as regarded their professional skill.

Mr. LAWRENCE understood Mr. Haywood to refer to the question of the two systems, and they must judge from the results whether one was better than the other.

Mr. BURNELL said he had carefully guarded himself in what he had said against drawing comparisons between English and French engineers. Upon the question of the relative merits of the two classes it was a singular fact that the French engineers had almost invariably consulted the English, and all the inventions that had altered the face of engineering science had arisen either in England or America. With regard to railways it was well known they originated in England, and the same thing occurred with reference to suspension bridges. The merit of that form of bridge they knew belonged to Telford. Steamboats, the electric telegraph, and many other inventions, which had tended to advance civilisation, were the results of the free-trade principles which prevailed in England, and of which he was a cordial supporter. The object of the paper was to call attention to the organisation of the corps of the Ponts-et-Chaussées, which he thought, for carrying out works necessarily in the hands of the Government, was superior to our system of appointing Government officers. The CHAIRMAN, in proposing a vote of thanks to Mr. Burnell, said he thought they must all, to a great extent,

participate in the feeling expressed by Mr. Haywood, on comparing the style of the public works in Paris with those of London; and with regard to the sewers, if anything was calculated to mitigate that feeling, it was, as far as he was personally concerned, in the visit he paid to the great brick tank at Barking, covering an extent of eleven acres, which for strength and excellence of execution could hardly be surpassed, and which showed what could be done in England in the way of first-rate brickwork. He was afraid they could hardly expect to settle the question this evening as to the comparative merits of the two plans, and he thought they must be content with supposing that each nation had settled down instinctively into the particular system which best suited its own peculiar constitution. He was sure they would pass a cordial vote of thanks to Mr. Burnell for his able paper.

The vote of thanks was then passed.

Proceedings of Institutions.

FARNHAM YOUNG MEN'S ASSOCIATION.—The lecture session of 1863-64 was brought to a conclusion on Friday evening, the 11th instant, by the delivery of a lecture on "Figures of Speech," by the Rev. W. L. Blackley, of Frensham. The Bishop of Winchester occupied the chair, and said it was no "figure of speech" when he expressed his regret that this successful session was over.

METROPOLITAN ASSOCIATION.—His Royal Highness the Prince of Wales has been pleased to accept the office of patron, and Her Royal Highness the Princess of Wales the office of patroness to this association. Her Royal Highness has also announced her intention to give annually a Bible as a prize to the female candidate who, obtaining a certificate of proficiency in needlework, obtains the highest marks in the elementary examinations held by this association.

STOCKPORT MECHANICS' INSTITUTION.—The twentieth annual report congratulates the members on the cheering prospects of the Institution. Notwithstanding the continuance of commercial depression, and all the disadvantages of removal, every department of the Institution has been more successful this year than in any previous one. The year 1862 closed with 504 members, but last year gave an increase of 361, making a total of 865. The average number of members, since the establishment of the Institution in 1834, is about 528. The total income of the past year, exclusive of donations, has been £406 16s. 9d. This is £150 more than the average of previous years. The members' subscriptions amount to £207 14s.; those of 1862 were £117 17s.; and the average of previous years has been £143 3s. 10d. The letting of the hall has been a source of considerable income, amounting to £36 6s. 6d. At the close of the year 1862, the library was reported to be in a very dilapidated condition; and the directors, on their coming into office, after a careful examination of the books, removed 188 volumes as unfit for further circulation on that account; and they have, during the year, purchased and added 293. In addition to that number thirteen volumes have been presented, and the President has purchased for the library 112 volumes of the best and most popular works of the day. The library now contains 4,888 volumes. The books issued in 1862 were 5,100; in the past year, 8,582. There have been, during the year, three lectures, one concert, and three readings, in connection with the Institution. The Mayor of Stockport (Ephraim Hallam, Esq.) has invested £100 as an endowment of the Institution in perpetuity, the interest to be appropriated annually in prizes for the most successful competitors in examinations of the arithmetic and drawing classes. These classes are now in so high a state of proficiency as to occupy the first position in the Lancashire and Cheshire Association of Mechanics' Institutes, in connection with which certificates for proficiency in algebra, mensuration, composition, French, and other

subjects, have been gained by students of this Institution. The credit of the Institution has been fully sustained, this year, in the mechanical, architectural, and geometrical drawing class, in connection with the Science and Art Department of Government. The Government returns show that, compared with the number of pupils who attended the examination, a greater proportion of them have received Queen's prizes than the members of any other Institute in Lancashire and Cheshire. In the reading classes the teachers report considerable general proficiency. The writing classes are overcrowded, and the students are making rapid progress. The arithmetic classes are well attended. About nineteen members meet for the study of algebra. There are also a grammar class, one for geography, for modern languages, for phonography, for elocution, for tonic sol-fa singing, in reference to which the local examiners report favourably. Five years ago the directors, seeing the great necessity for female education, decided upon the establishment of female classes in reading, writing, arithmetic, and sewing. Some difficulties presented themselves, in the want of room and suitable teachers. These, however, have been overcome, and the result has more than realised the Committee's most sanguine expectations, as testified by the number of female members, which increased in 1858 from 23 to 47. This year they number 243. The directors have made arrangements with the British and Irish Magnetic Telegraph Company to open an office in the Institution for the transmission of messages to all parts of the United Kingdom and the Continent, and for the supply of such daily telegrams as are posted in the Exchange and other public buildings in the City of Manchester.

THE MONT CENIS TUNNEL.

A paper was read before the Institution of Civil Engineers, by Mr. Thomas Sopwith, jun., on February 16, on the actual state of the works in this tunnel, with a description of the machinery employed.

The author said that during the last twenty years many routes had been surveyed and recommended for crossing the great barrier of the Alps. Of these, that by the Mont Cenis was generally considered the most feasible; and it was only a question, whether the mountain should be crossed by a series of inclines, or whether a tunnel should be made. In 1857, Messrs. Sommeiller, Grandis, and Grattoni, brought before public notice a new system of boring by machinery, instead of by hand labour. A Government commission was appointed to examine and report upon it, and to see if it could be applied to the boring of the tunnel under Mont Cenis. Their report was favourable, and M. Sommeiller and his partners were shortly afterwards charged with the execution of the work.

The ends only were available for attack, it being impossible, as was known from the first, to sink shafts. It was feared that the ventilation would seriously retard, or altogether prevent, the completion of the tunnel; but this fear was uncalled for, as the artificial ventilation in collieries overcame greater natural difficulties, and the ventilating current passed through a longer distance than could possibly be required in this tunnel. M. Sommeiller also proposed to use compressed air for driving the machinery, and calculated that on its escape, a volume of fresh air would be supplied, adequate to the requirements of the workmen. The tunnel at the Modane, or French side, was of the following dimensions:—25 feet 3½ inches wide at the base, 26 feet 2½ inches wide at the broadest part, and 24 feet 7 inches in height; the arch being a semi-circle nearly. At Bardonnèche, the height was increased 11½ inches. The exact length between the ends was 7·5932 miles. The present ends would not be the permanent entrances, as it was intended that a curved gallery should leave the tunnel at the north side, 415 yards from the end, and at the south side, 277 yards. At Modane, the tunnel was built entirely with stone; at

Bardonnèche, for the greater part, the side walls only were of stone, and the remainder of brick. The Bardonnèche end was 434 feet higher than that at Modane. For one-half the length of the tunnel, therefore, from Modane to the middle, the gradient would be 1 in 45½; the other side being driven with only sufficient fall, 1 in 2,000, to allow of the water escaping. At Modane, the entrance of the tunnel was 328 feet above the bottom of the valley, where the workshops were placed, with which there was a communication by means of an inclined plane, worked by a water balance.

Different systems of tunnelling by machinery had been tried, amongst others one by Captain Penrice, R.E., in which it was intended to drive a gallery about 4½ feet diameter, and by means of repeated blows from a heavy frame loaded with knives, to reduce the whole of the excavated materials to small chippings and dust. It seemed, however, to the author, that any system of tunnelling must be deficient which did not make gunpowder available; and that by the trituration of the rock to such small particles, as in Captain Penrice's system, a great amount of work was unnecessarily performed.*

In M. Sommeiller's system, whilst machinery was employed for accelerating the progress usually made by hand labour, gunpowder was also available. He had succeeded in producing a compact machine, not weighing more than 6 cwt., which could pierce a common borehole, about 1½ inch diameter, and 3 feet deep, into a rock in twenty minutes, where two miners would have required two hours. Further, he had arranged a moveable support capable of carrying eleven such machines, any one of which could be worked at almost any angle, and of allowing the free action of each, in a gallery 10 feet square. This support could be removed when it was necessary to explode the holes bored by the machines. The machine consisted of two parts;—one, a cylinder for propelling the borer against the rock; the second, a rotary engine for working the valve of the striking cylinder, turning the borer on its axis at each successive stroke, and advancing, or retiring, the striking cylinder, as occasion required. It gave 250 blows per minute. The effective pressure on the piston in striking was 216 lbs.; the length of the stroke was from 2 inches to 7½ inches. Although simplified as much as possible, they were liable to frequent derangement, and a large stock was kept on hand. The compressed air was used at a pressure of five atmospheres above atmospheric pressure, and was conveyed to the 'fore-head' of the advanced gallery by a pipe 7½ inches in diameter. The advanced gallery was the only place where the machines were used; the enlarging of the tunnel to the full size, walling, &c., being performed by manual labour. The system of working was to bore eighty holes in the fore-head of the advanced gallery. The frame and machines were then withdrawn, and a set of men charged and fired the holes; these were afterwards replaced by another set to remove the *débais*. Two descriptions of machines for compressing air were in use,—one on the hydraulic ram principle, the other resembling a pump. In the first, the water was admitted, with a pressure of 85½ feet, into a column, or vessel, containing air, about 14 feet high and 2 feet in diameter. The water by its momentum rushed up the column, compressed the volume of air, and forced it through a valve into a reservoir. The pressure valve being closed, the exhaust valve was opened, and the water fell in the column, at the same time its place was taken by air, and the machine became ready for another stroke. This machine made 2½ strokes per minute, and was capable of supplying about 20 cubic feet of air, compressed to five

atmospheres, per minute. The other machine consisted of a horizontal pump and two vertical branches. The piston was surrounded by water, which rose and fell alternately in the two columns: when it rose, compressing the air, and forcing it through the outlet valve; and when it fell, creating a vacuum, which was filled by air at atmospheric pressure.

The tunnel, on the 30th June, 1863, had been driven (including the advanced gallery) at Modane 1092·25 metres, and at Bardonnèche 1450·00 metres. The advancement in June last, at Modane, was at the rate of 4·719 feet per day. At this rate of progress at both ends, the tunnel would be finished in 9 years 2½ months from that time. It was not, however, too much, in the author's opinion, to expect a progress of 2 metres per day at each end, seeing that machines had only been in use at Bardonnèche about two years and a-half, and at Modane half a year.

The result of a rough comparison was to show that, in the present development of the Sommeiller system, an advancement three times quicker than by hand-labour might be effected, but at about two and a-half times the cost; judging rather of places where it might be generally applied, than by the Mont Cenis only. In the case of a tunnel through rock, costing, when completed, £30 per yard, the two systems might compare as follows:—an increased advancement in favour of M. Sommeiller's machinery of 3 to 1, at an increased cost of 4 to 3.

Fine Arts.

THE FINE ARTS IN PARIS.—A very important step in the way of artistic education has been taken by M. Nieuwerkerke, the Imperial Superintendent of the Fine Arts. The gallery in the Louvre, in which the Sauvageot collection was recently placed, has been converted into a studio, where artists and amateurs will be admitted shortly to sketch the vases, jewelled cups, bronzes, and other works of art belonging to the various collections in the museum, under the superintendence of an officer of the establishment. This will be a great boon to designers and ornamental artists of all classes, who have heretofore had little opportunity of practically studying the finest products of modellers, carvers, and chasers of the best periods. The auctioneer's hammer has disposed of a large number of fine works of art during the last week, but the Delacroix sale has taken the cream off the bowl. At an important sale which occurred on the 9th instant, "Clorinde," a fine work by the painter last named, was sold for 7,500 francs, to the astonishment of all who had watched the collective sale of his works; some of Decamp's pictures fetched fair prices; the well-known "Turkish Guard" fetched 3,700 francs, and "Diogenes throwing away his Cup on seeing a Boy drink out of the hollow of his hand," by the same painter, was withdrawn at 10,000 francs. A picture by Prudhon and Mayer, "A Nymph attacked by Cupids," was also withdrawn at 15,000 francs. The "Two Foscari," by Robert Fleury, fetched 7,200 francs. M. Alaux, the painter, formerly master of the French school at Rome, recently died at Paris, at the age of 79 years. M. Vital Dubray, the sculptor, had an unfortunate accident the other day. He had just completed an equestrian statue of Napoleon I. for the town of Rouen; a commission had been seen and highly approved the work, which was about to be delivered into the hands of the moulder, and M. Dubray was in the act of turning it about to exhibit his work to some important visitors, when the central support gave way, and in an instant the labour of a whole year lay, a confused heap of clay, on the floor. M. Hermin, lately deceased, has bequeathed to the Imperial Library a magnificent collection of engravings and sketches relative to the history of France. It fills a hundred portfolios, and includes 20,000 engravings, many of them of great rarity. Amongst other curiosities are five hundred of

* One of Capt. Penrice's machines is now at work in a rock tunnel on the Levanto and Spezia Railway, and recent letters from Italy state that it is cutting the gallery, 7½ feet in diameter (not 4½ feet), at the rate of about 14 feet run in the 24 hours. The gallery is afterwards enlarged by blasting or other means.—Ed.

the rare illustrated almanacks of the sixteenth and seventeenth centuries, some of them dating from the time of Henry IV.

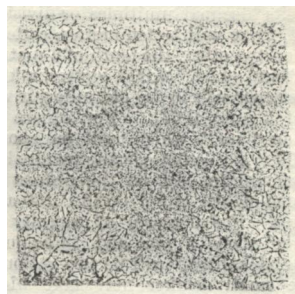
Manufactures.

TOW AND WASTE OF FLAX.—The paper manufacturers of the North of France propose to address a petition to the Minister of Agriculture, of Commerce, and Public Works. Its object is, to demand from Government that the waste of flax, common tow, and refuse, now free for export, should be in future assimilated to rags, and subject to the same duties. The petition, of which an abstract is given in the *Paper Trade Review*, states that flax waste, common tow, or refuse, forms an important part in the making of paper in France. In the treaty of commerce with England, the Government, acknowledging the necessity of protecting the paper-trade, maintained protecting tariffs for rags; but on one side it declared free to export flax and tow. It would seem natural that flax waste, unfit for spinning, and entering into the class of rags, should be assimilated to them. It has not been so; they have been, and are still, free from all export duty. However, for some time, and until the month of August, 1863, the administration of customs had stopped their exportation in some places, considering them as rags. But on August 25, 1863, the Director-General of Customs informed the Director of Dunkirk that, in answer to interested merchants, experts had declared that, although waste can be used for paper-making, it is also used for the making of coarse cloth packing, and for stuffing furniture or seats; that the consulting committee of arts and manufactures had considered the question, and that the departments of commerce and finance had, on its advice, decided to permit its free exportation. The consulting committee [the petitioners go on to say] might, indeed, say that coarse cloths can be made from, and furniture stuffed with, tow; but, in reality, their use for this purpose in Belgium is small, and the commonest sorts, such as dried flax waste, are completely unfit for that. It can even be proved that all exported in Belgium was bought by the Belgian paper-makers. These have caused the rise in price of which the northern manufacturers now complain. The augmentation of their first matter has risen from three to four francs the cwt. (100 kils.), which makes a difference of six or seven francs the cwt. of manufactured paper. However, the products of the French paper-trade have undergone a depreciation equal to these figures. There has resulted such a situation as many paper-makers could not resist. The northern paper-makers ask, consequently, that the decision of the committee of arts and manufactures should be changed, and conclude that the refuse and tow should be reckoned as rags.

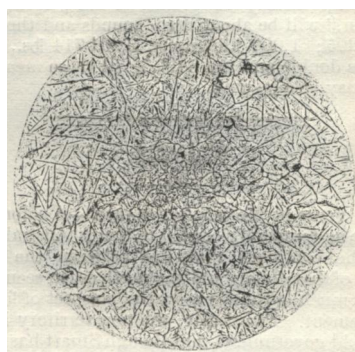
CARPET MANUFACTURE.—The action commenced on 21st September, 1859, by Messrs. Crossley and Sons, the well-known carpet manufacturers at Halifax, against Messrs. Bright and Co. of Rochdale, for an alleged infringement of a patent granted on 28th September, 1850, to Messrs. Crossley, Collier, and Hudson, for "improvements in printing yarns for, and in weaving carpets, and other fabrics," has just terminated, the arbitrator's award is in favour of Messrs. Bright and Co., the defendants; the arbitrator having found that the plaintiffs were not the first and true inventors of the improvements in printing yarns, and that the defendants have not infringed that part of the patent which relates to improvements in weaving carpets and other fabrics. The general costs of the reference, and award, are to be paid by the plaintiffs. These must be very great, as, in addition to the witnesses examined, the models on both sides were extremely numerous, and in the course of the proceedings the plaintiffs sent up to London, and worked by steam-power at their warehouse in the city, a loom containing the improvements in weaving alleged to be infringed. The defendants also had

two looms set up, and working by steam-power in the neighbourhood of Westminster.

NATURE PRINTING FROM STEEL.—Below are given prints from steel blocks, prepared by Mr. Sorby, as described in the *Journal* of the 4th inst., p. 258:—



Square Block of Iron twice converted; transverse section showing the centre incompletely converted.



Round Bar of "Homogeneous Metal" converted—transverse section.

Commerce.

COTTON IN MEXICO.—A French vessel has arrived at Havre with a cargo of satisfactory cotton grown in Mexico. There is no reason why cotton culture should not be extended in Central America. An excellent specimen was grown in Honduras, and was shown before the members of the Society of Arts by Mr. Temple some years ago; and excellent samples from Venezuela and other States at the International Exhibition.

THE FRUIT TRADE.—The imports of currants last year marked the largest amount known, upwards of 46,000 tons, of which 38,400 were taken for consumption, and about 5,000 tons exported. Of raisins the imports have been larger. Of 21,000 tons received, 15,600 were taken for home consumption, and 2,000 tons re-exported.

TEA.—The shipments from China to Great Britain, in the twelve months ending May, 1863, marked the large amount of 121,273,580 lbs., and in the eight months ending January last, 99,776,226 lbs. had been shipped.

TIMBER.—The quantity of wood and timber imported last year (exclusive of mahogany and other hard woods, and dye-woods), was 3,437,915 loads, an excess of half a million loads on the previous year. The duty received by Government on this wood, in 1863, was nearly £272,000.

WINE.—The wine trade does not show that expansion which was anticipated from the reduced duties, for the quantities taken for consumption last year was below those of 1861. Of ten millions and a half gallons which paid duty, six millions were white wines, and four millions and a half red. The total imports were about two million gallons in excess of those of 1862.

PROPOSED NEW WEIGHTS AND MEASURES.—The weights and measures to be authorised by Mr. Ewart's permissive Bill, if it should pass, will be as follows:—Instead of the yard there will be the "metre," which will be about a yard and a tenth, 39·371 inches, the other measures of length to be its decimal multiples or divisions; thus, on the one hand, there will be ten metres, called the "dekametre," and on the other, the tenth of a metre will be the "decimetre," and so on. 1,000 metres, a kilometre, will be the nearest approach to the old mile; it will be nearly two-thirds of a mile, 0·621. For square measure the unit will be an "are," which will be about 120 square yards, 119·603: a "centiare," the hundredth part of an are, or a square metre, will be the nearest to our square yard, being one-eighth more, 1·126. 100 ares, a hectare are 2·471 acres. For measures of capacity the unit will be the "litre," about a pint and three quarters, 1·761. Ten litres, a "dekalitre," will be two gallons and a fifth, 2·201. The small drinker may take his "decilitre," about the sixth of a pint (0·176), or his "centilitre," which is a tenth part of a decilitre. For weights the unit will be a "gram," nearly 16 grains, 15·433; 1,000 grams, a "kilogram," will be about two pounds and the fifth of a pound, 2·205; 1,000 kilograms, 2,204·714 lbs., will be a ton. The double and the half of all these measures and weights may also be used.

Colonies.

COLONISATION OF NORTH AUSTRALIA.—A colonial paper says that the temporary cession to South Australia of that part of the continent that lies between the northern boundary of that colony and the north coast, seems to have awakened much enthusiasm on the prospect of founding a new settlement. Practically, the new territory is isolated from the old government, and though Stuart has passed by land from Adelaide to Van Dieman's Gulf, it is very doubtful whether stock could be sent across the continent by his route. In course of time the central tract may become pastorally tenable, but an abundant water supply must be first discovered or provided. This would probably be a work of great difficulty and expense, so that it appears that a considerable time would elapse before the squatters of South Australia could spread northwards in sufficient force to occupy the new territory, more especially as there are vast areas of land of superior quality more conveniently situated, as respects seaports and markets, and which will first attract attention. The better plan would be to commence on the north coast, to found fresh settlements there, and, whilst maintaining a sea communication with the parent colony, to work gradually southward, so as to meet the advancing settlers of South Australia, for the basis of fresh colonisation must be pastoral occupation, and the first thing to be done is to induce squatters to take their flocks and herds to the new country. The chief difficulty will be want of money. The sale of land will yield something, but it will not be wise to stimulate speculative purchases simply for the sake of getting money. The value of the land will depend upon the prosperity of the settlement, and the Government of South Australia should not expect the new colony to pay its way from the very first, but there is every prospect that, with good management and liberality on the part of the South Australian Government, the work of colonisation may at no distant date make rapid progress, and that by the establishing of stations at intervals along the already partially explored track, the difficulties of the land route to the northern coast may be overcome, and the interior of this vast continent be gradually opened to civilisation, and ultimately afford an enlarged field for British enterprise. Central Australia is divided by Mr. Waterhouse, the naturalist, who accompanied Mr. Stuart in his last expedition across the continent, into three zones—the first he describes as the district of saltbush and springs; the

second is characterised by the presence of mulga shrub; the third is the tropical district of Arnheim's land. The abundant and apparently permanent supply of water—independent of rain—renders the first zone very suitable for pastoral purposes. The springs mostly appear in hollows, emerging from small boggy mounds which they overflow, and seem to be of volcanic origin; there is evidence of a large tertiary drift, and Mr. Waterhouse is of opinion that many springs may be obscured by this drift and will be disclosed as the country becomes examined. The second zone extends from latitude 27½ to about 17½; the land is not of promising quality, alternately stony and sandy; the sand yields only mulga shrub, spinifex, or porcupine grass, with a little grass thinly scattered in small patches; permanent water is hardly to be found; here and there, however, are patches of better country: to make this belt of country habitable it will be necessary to store the water carefully. The third zone, from latitude 17½ to the northern coast, has the characteristics of a tropical climate, the grass and timber improve, and at places the vegetation is luxuriant. In regard to the climate, Mr. Waterhouse says that even in winter they found the heat very oppressive, and he fears that in summer, especially near the coast, the climate will be hardly suitable for Europeans; this, however, is to be tested by experience; and it may be mentioned that only a few years ago the neighbourhood of Rockhampton was erroneously thought to be too tropical for European settlement.

THE NEW ZEALAND EXHIBITION, 1865.—The decisions and regulations of this exhibition, proposed to be held at Dunedin, in Otago, in January next year, were published recently in the *Journal*. For the information of intending exhibitors it may now be stated that applications for space and all other information should be addressed to John Morrison, Esq., the government agent for the colony of New Zealand, 3, Adelaide-place, London-bridge, who has placed the whole correspondence and business details of London management in the hands of Mr. P. L. Simmonds, who, with Dr. Lindley, had the superintendence of the colonial department of the International Exhibition of 1862. The enterprise is being carried out with great spirit and energy by the colonists. The various Australian colonies will take a prominent part. The intercolonial steamers have agreed to convey goods for exhibition to and from for one rate of freight, and the English shipowners have very generally reduced their charges on goods intended for the exhibition.

THE BENGAL AGRICULTURAL EXHIBITION is over. The attempt to induce native ladies to visit the Exhibition utterly failed.

SOUTH AUSTRALIA.—The total imports at Port Adelaide, from the beginning of the year 1863, to December 19th, have amounted to £1,815,503, and the total exports to £1,848,849. The value of the cereal exports from all ports in the colony during the same is £718,561 12s. 9d. The customs' receipts have amounted to £153,861 8s. 2d., and the railway receipts to £94,694 11s. 4d. The land sale receipts from the beginning of the year to December 24th, have been £190,648 13s., the quantity sold being 157,582 acres. The accounts of the crops continue to be favourable, and the average yield of wheat and barley is larger than has been had for many years. The accounts from the mines continue to be favourable; the increased value of copper tends to increase workings in some mines whose returns are small. The reports from the Campbell's Creek Lead Mine are highly favourable. The wines of last vintage are fast being brought into consumption, more especially the medium and inferior qualities, which pay the growers better by an early sale.

ROADS AND MILITARY SETTLEMENTS IN THE NORTHERN ISLAND OF NEW ZEALAND.—A memorandum of a proposed system of roads and settlements for the defence of the provinces of the Northern Island of New Zealand, has been under the consideration of the Ministry in that colony. This document points out that the most obvious means of preventing future wars would be the making of

roads that could be used by the military everywhere throughout the country, and the introduction of such an amount of armed population, formed into defensive settlements, as would overawe the native tribes, or at least be always ready and able to check or punish their depredations. Both these measures have been commenced. It is proposed in this memorandum to extend and continue them as far as appears to be practicable in the present circumstances of the colony. The first consideration is—what lines of road to make, and where to place the settlements? Speaking in general terms, the Northern Island may be described as one entire expanse of forest and mountains, with the following exceptions:—A broad belt of country, generally open, stretching from the Waikato river on the one side, and the mouth of the Thames river on the other, and running all the way to Napier, forty or fifty miles wide at one part, and narrowing gradually southwards down to the coast at Cape Turnagain. All round the Cape Turnagain to Wairapara, and up to the west coast, runs a comparatively narrow belt of open ground, running up occasionally some distance into the interior, and forming rich values fit for settlement. Near to the shores of Lake Taupo, on the west, east, and south, are plateaux or terraces of some extent, wooded or grassy, which form a sort of elevated table land in the middle of the island, interspersed with clusters of high mountains, but soon descending, except on the Hawke's Bay side, into rougher ranges and gullies, forming, especially on the west, tracts of difficult country, separating these central terraces from the available valleys and flats round the coast. Now, the most ready way to overcome this country by means of roads and settlements, at first sight, would be to strike through the centre of the land from Auckland to Napier, and from the Bay of Plenty to Wanganui or Rangilikei, with branches through the heart of the tracts intervening. The cost of the 1,000 miles of roads proposed may be calculated at an average of £1,500 per mile, or £1,500,000. The introduction and settlement of immigrants, and the making of roads as above proposed, would cost in all about £2,300,000, but as money will be wanted for the heavy expenses of the war during the present and probably the next year, which cannot be estimated at less than a million, it is proposed to add this sum to the existing loan. The total cost of the present scheme will be £3,500,000.

Obituary.

The late Sir WILLIAM BROWN, Bart., was born in May, 1784, at Ballymena, in the county of Antrim. His father, Alexander Brown, was engaged in the linen trade, which was then carried on mainly as a domestic manufacture. The regular employment thus afforded, and the staid and thrifty character of the people—rather Scotch than Irish—and commonly Presbyterians, gave to the locality an aspect widely different from that of the central and southern parts of Ireland at the same time. Young Brown was sent to school in Yorkshire, but his health was weak; an affection of the eyes interfered with his education; and it is not improbable that the lack of physical power which he displayed later in life was traceable to the management of his boyhood. When he was about sixteen his father went to the United States, and settled at Baltimore, starting as a merchant, with good connections in the linen trade, and taking his sons into his counting-house. The time was favourable, and the man was well fitted to use the advantages it offered. Prudent, patient, and moderately pushing, he had but to hold his ground and grow with the city and the state. In 1800 the troubles left by the revolutionary war had vanished, the new Government was settled, and the centres of commerce, of which Baltimore was one of the chief, were becoming yearly more and more busy and prosperous. Cotton, the first bags of which coming from the

United States, had been landed in Liverpool in 1785, and there seized by the customs' officers as not being the produce of the States, was already becoming an important article of export. Upland cotton, nearly worthless till Whitney's saw-gin, in 1793, began to supersede hand-labour in discarding the seed, was, in 1800, creeping rapidly over large districts in the Southern States; and the cotton planters were coming into existence as a thriving and powerful class. The States were already sending more cotton to England than were the West Indies. But the trade was hampered by want of capital, distance of market, and slow communication. Men who could be trusted, who knew the English markets, who had connections there, who could open channels of trade with Europe, and insure the returns, and, especially, who could make advances on goods ready for shipment, were much sought for, and could make their own terms. Among such men was Mr. Brown. The young house, as it grew, was extended to New York and Philadelphia. The business, small at first, was soon extended. They seldom bought or sold; finding more profitable use for their capital in conducting, and making advances on, the transactions of others: taking ample security, and realising a moderate but certain profit. Banking was little understood, and still less relied on, in the United States. On a large scale, its facilities were more used by politicians than applied to trade; and where knowledge of markets, and of men, could be had together with banking accommodation, customers were never wanting. As Mr. Brown's sons grew up they were taken into partnership; and soon it was determined that William, then approaching twenty-five years of age, should return to the old country, and open an office there. He did so, early in 1800, and, having married a Miss Gihon, also a native of Ballymena, he went to Liverpool; and was soon established there, in correspondence with the house in America. Again the period of starting was favourable. The years 1803 to 1808, inclusive, had been years of depression in the cotton trade. With 1809 came better times, and nearly thirty years expired before a similar period occurred. Also the banking system of the United States was, for some years after this date, in such a condition as greatly to favour the operations of those who, having capital and credit in both countries, could use them with competent knowledge and discretion. The first "Bank of the United States," got up by Alexander Hamilton, when Secretary of the Treasury to the Federal Government, and opposed by Jefferson and his followers, had, from the first, been used by the "Federal" party as a political instrument. Its charter was to expire in 1811. The proposal to renew it brought on a party contest. It was negated by a narrow majority. The advocates of state banks being in the ascendant, a large number of such banks were soon chartered. Then came the war with England. The government determined to meet the war expenditure with loans. These could be had easily only through banks; and banks were further multiplied as feeders to the public treasury. In August, 1814, specie became alarmingly scarce. The banks were authorised to suspend specie payments, and, with few exceptions, they did so. The war was closed in less than six months; but the flood of inconvertible paper was then, as now, found so agreeable to all parties, that the suspension was continued, and new banks formed, so that every part of the country might share the new-found benefit. The New England Banks, to their credit, strove hard to maintain cash payments, but the only apparent result was to drive trade to Baltimore and the more southern ports, where debts, and even import duties, could be discharged in a depreciated currency. Also, at this time, 1810-12, transatlantic produce, especially coffee and sugar, abundant in England, and there selling at sixpence a pound, was selling on the greater part of continental Europe at eight and ten times that price. There were high risk and large profit, but for those who avoided the risk and took only a moderate share of the profit, the gains were great. The

American and Liverpool houses held on their course, on new and more extended grounds, indeed, but in close alliance, under the same principles, and, in fact, under the same superintendence (for Mr. Alexander Brown died only in 1834) till the sons were some fifty years of age, and till the firm of Brown, Shipley, and Co., of Liverpool, became known wherever the American flag was seen. The house never encountered but one severe trial. That came when its strength was fully developed; it came, probably, from no want of mercantile skill or foresight; and it was so averted as to attract the attention and confirm the respect of the entire mercantile world. The circumstances are worthy of remembrance, even apart from their connection with the life of William Brown. The years 1832-33-34 were, in England, years of gradually increasing commercial ease and prosperity. The prices of corn and provisions were gradually declining through the whole period, and the low level thus reached in the cost of food was for some time maintained. From October, 1834, to February, 1836, the official monthly average price of wheat ranged between 35s. 6d. and 41s. per quarter. Capital had accumulated, and the rate of interest had fallen. From July, 1832, to July, 1834, the minimum Bank of England rate was 3 per cent., without change. The demand for cotton, woollen, and linen goods, and generally for all the principal articles of British manufacture, was increasing, both for home consumption and for export. New factories were being built, and wages were rising. Money being abundant, a disposition to speculate in joint-stock companies, and especially in joint-stock banks, became prevalent; and several new banks, with numerous branches, were opened in the North of England, to supply the growing demand for banking accommodation. But there was something underneath, not seen. The ordinary course of trade was being interfered with from without to a dangerous extent, both in England and in America. When, in 1832, it was determined that the trading monopoly of the East India Company should cease, the company began to realise its commercial assets; and pending the ultimate disposal of the money, paid it into the Bank of England. The Bank privately lent it to the bill-brokers at 2½ per cent. Shortly afterwards, the payments on account of the loan contracted by the Government to pay compensation for the slaves in the West Indies also began to accumulate at the Bank, and this sum, a very large one, the Bank also lent in like manner. At the same time the second Bank of the United States was coming to the end of its charter, and the Government was determined not to renew it. General Jackson wished to restore the use of gold and silver coin in the States, and in order to do this, Congress had, in 1834, prohibited notes of less than five dollars, and, by reducing the fine gold in the eagle from 246 to 232 grains, and so raising the value of the English sovereign as measured in dollars, by more than eight per cent., had prepared to draw gold from Europe. The United States Bank was called upon to pay in specie the amount it owed to the Government, and had to borrow in Europe to do this. The State Banks who were to receive the Government deposits were so favoured on condition that they should hold large reserves of specie. Then, at the end of 1835, our stocks of American produce proved very low. Large orders went out for fresh supplies; but before they could arrive the drain of gold from this country had gone so far, in spite of a considerable rise in the rate of interest, as to alarm the Bank. In December, 1835, it held in bullion £7,595,000—in November, 1836, only £3,840,000. The draft had been made chiefly through the American houses, and was set down to excessive speculation in American produce, fostered by these houses. The Bank began to refuse their acceptances. Already, by the arrival of large quantities of produce, ordered in the first months of the year, which had come to falling markets, the weaker of these houses were pressed to the full extent of their means. They, in turn, had pressed their debtors; and now, their own credit failing, they became desperate. Produce was forced on the market, and signs of a panic

began to appear. In November, 1836, the Agricultural and Commercial Bank of Ireland stopped payment, and the Northern and Central Bank at Manchester would have been stopped had not the Bank of England for a time supported it, in view of the probable consequences. For several months after this, under increasing pressure, and such pressure as probably no private firm had ever before sustained, Brown, Shipley, and Co., of Liverpool, stood before the storm, and so stood till the worst of it was over. Then, laden with obligations involving the probability that they would have shortly to provide about two millions sterling—with a general suspension of the banks of the United States crippling their powers in that direction, amply secured, indeed, by the possession of produce, but unable to convert it into money—they laid their affairs before the Treasury Committee of the Bank of England. It was a case of even national import. The facts were clear. The aid asked was very large. But the evil to be averted was great, and the ultimate risk was not so. The aid was given. It was discreetly applied. Its effect was all that had been hoped for; and the transaction was closed to the entire satisfaction of both parties. Further, it carried with it no reflection upon the ruling virtue—the prudence—of William Brown; and it placed him at once in such a position, with reference to the American trade, as no man had before occupied. Mr. Brown had not, down to this date (1837) taken a very active or prominent part even in the public affairs of the town of Liverpool. But that, afterwards, having a decidedly liberal bent in politics, he should be drawn into the free trade party, should be borne with it into Parliament, and should have opened to him every avenue to public distinction in which a princely income could be used, was to be expected. He was not without a relish for such distinction, but he was ill-fitted for it. He had but little physical power. His mental power was not great; and the sedulous application of a long and uniform life had fixed its action to a somewhat narrow round of thought. His strength lay in moderate ability, closely allied with and governed by the prudential virtues, and steadily applied to a definite purpose. He did not attract others; though he readily won their confidence in his probity and stability of purpose. Hence he commonly acted alone. His means enabled him to make large gifts to public uses; and in his choice of these uses he strongly marked his sympathy with patient industry, looking, through small beginnings, up to wealth, and the consideration that wealth brings with it. His gifts were made with sound judgment—with the same balancing of the power to be expended against the assured value of the object to be attained, whence had sprung his own success as a mercantile man. Hence they are likely to realise his intentions. And, regarded as a whole, his career may be said to exemplify better, perhaps, than that of any man who has died in England for many years—because more singly and clearly—the net value of prudence, patience, and perseverance, as promoters of commercial success. In January, 1863, Mr. Brown received a baronetcy; the same honour being, at the same time, conferred on one or two other men distinguished in commerce. He survived his wife and nine children, and is succeeded in his title, and the bulk of his property, by his grandson, now Sir William Richmond Brown, Bart. He was elected a member of the Society of Arts in 1853, and more than once served the office of Vice-President.

Notes.

NATIONAL MUSEUMS.—The following petition of the delegates of the trades of London, has been presented to the House of Commons by Sir John Shelley:—"Your petitioners, representing the following trade societies, viz.: carpenters (6 societies); painters (4 societies); tailors (3 societies); carvers and gilders (3 societies); French polishers (2 societies); bootmakers (2 societies); cabinet

makers (West and East End societies); goldsmiths and jewellers (West End and Clerkenwell); silversmiths (united branches); engine-turners; engravers, and dial finishers; coachmakers; coachmakers, United Kingdom; coach painters; coach-lace weavers; women's shoemakers; brass founders; brass-moulders' firemen; brass-moulders' finishers; plumbers; plumbers' brass finishers; tinplate workers; stove makers; plasterers; stonemasons; bookbinders; letterpress printers; smiths; machinists; farriers; curriers; wire weavers; plain and fancy silk weavers; umbrella and parasol silk weavers; upholsterers; and dyers; would earnestly solicit the attention of your honourable House to their case, as embodied in the following resolutions, unanimously adopted:—1. This meeting of delegates of the trades of London, specially appointed and convened to give expression to their views and desires on the opening of the national museums, galleries, and libraries on Sunday afternoons, hereby declare and make known that, with the greatest unanimity, the various trades for which they appear have expressed their strong desire for the same, as a measure of right and justice, and of social and art culture, for the people. 2. The said opening of the national institutions on Sundays is not urged from any antagonism to religion or the established forms of worship, but with a sincere conviction that, in the afternoon improvement of man's nature and intellectual capacity a religious duty perfectly in accordance with the morning worship will be fulfilled. 3. We, as practical working men, regard the assertion that the opening of the national museums, &c., would convert Sunday into a working day as fallacious and erroneous, and as being made by parties unacquainted with the tendency of the opening of such places, which is to cause men who now work at home on that day to abandon it, and take recreation. That we, as working men, would be the last to impose any injustice upon the attendants of such places, and conscientiously believe that such public service will be cheerfully and voluntarily rendered by the payment of a fair remuneration. 4. The concession of the opening on Sunday of the National Gallery of Ireland warrants the hope of the same privilege being afforded to the people of London; and the Government (in the person of Lord Palmerston as Premier) will be waited upon by the delegates in deputation, to urge the opening of the National Gallery and other institutions, and also the carrying out the strong wish of the late Mr. Sheepshanks, of his pictures (the gift to the nation) being opened to public inspection on Sunday. 5. A petition to be drawn up in accordance with the above resolutions, and entrusted to Sir J. V. Shelley, Bt., for presentation to the House of Commons. Your petitioners therefore, on the part of the large bodies of working men they represent, most earnestly pray your honourable House to extend the principle established by the opening of Hampton Court Palace, Kew Gardens and Museum, the National Gallery of Ireland, the Picture Gallery of Greenwich Hospital, &c., by the opening of the remaining national institutions paid for out of the taxes of the people on Sunday afternoons. And your petitioners will ever pray.—JAMES H. WRIGHT, Chairman.

AGRICULTURAL MEETINGS.—The following agricultural meetings and shows are announced to be held before Midsummer:—Kelso Agricultural Society, at Kelso, on the 24th March; the Royal Dublin Agricultural Society's spring meeting, at Dublin, on the 29th March and three following days; the Lauderdale Agricultural Society, at Lauder, on the 2nd April; the Royal Jersey Agricultural Society, at St. Helier's, on the 6th April; the Wharfedale Agricultural Society, at Otley, on the 15th April; the Great National Horse Show, at Dublin, on the 15th and 16th April; the spring meeting of the Ayrshire Agricultural Society, at Ayr, on the 26th April; the International Steam Ploughing Match, at Roanne, France, April 27th to May 7th; the Royal Jersey Agricultural Society's second meeting, for cows and implements, May

25th; the Royal Cornwall Agricultural Society's meeting, at Saltash, Plymouth, June 1st and 2nd; the North Hants Agricultural Society's meeting, at Basingstoke, June 2nd; the Bath and West of England Agricultural Society's meeting, at Bristol, June 13th to 17th; the Norfolk Agricultural Society's meeting, at King's Lynn, June 15th; the Oxford and Banbury Agricultural Society's meeting, at Banbury, June 21st; and the Essex Agricultural Society's meeting, at Harwich, June 23rd. The following meetings will be held in the Netherlands:—At Harlinger, Friesland, June 8th, for agricultural implements and machinery. At Zieriksee, Zealand, a port near Rotterdam, June 13th, for agricultural implements and machinery. The great annual meeting or congress of Dutch agriculturists at the Lake of Haarlem, June 23rd, with a market for implements.

RAILWAYS.—Mr. Thomas Brassey, the railway contractor, is said to have entered into contracts with the Russian Government, amounting to £24,000,000 sterling, to construct railways from St. Petersburg to Odessa, and from Odessa on to Sebastopol, in the Crimea.

THE BRITISH ASSOCIATION will hold its next meeting at Bath during the week commencing Wednesday, the 14th of September, under the presidency of Sir Charles Lyall, F.R.S.

MEETINGS FOR THE ENSUING WEEK.

- MON. ...Society of Arts, 8. Cantor Lectures, Mr. W. Burges, "On the Weaver's Art."
Actuaries, 7. Mr. Samuel Brown, "On Friendly Societies."
Medical, 8½. Mr. Jabez Hogg, "Eye Diseases as determined by the Ophthalmoscope, more especially in relation to the Diagnosis and Surgical Treatment of Glaucoma."
Asiatic, 3.
R. United Service Inst., 8½. 1. Dr. W. L. Maclean, "On the Influence of the present Knapsack and Accoutrements on the Health of the Infantry Soldier." 2. Dr. Richard Domenichetti, "On Sickness Charts, illustrating Diseases, &c., of the Army."
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."
TUES. ...Ethnological, 8. 1. Mr. Thos. J. Hutchinson, "On Certain Native Tribes of Brazil and Bolivia." 2. Professor Busk, "An Account of a Human Skeleton Discovered under a Bed of Peat on the Coast of Cheshire." 3. Dr. Kirk, "A Description of some Crania of the Manganjo Race of Negroes on the River Shire in South Africa, with an account of the Tribes."
Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion on Mr. Phipps' Paper "On the Resistance of Bodies passing through Water."
Zoological, 9.
WED. ...Geological, 8.
R. Society of Literature, 4½.
Archæological Assoc., 8½. 1. Mr. Clarence Hopper, "On some Particulars relating to Bogos de Clare." 2. Mr. Cuming, "On Mediæval Representations of Grotesque Animals."
SAT.R. Botanic, 8½.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par.
Numb.

Delivered on 24th February, 1864.

19. Railway and Canal, &c., Bills (38. Brecon and Merthyr Tydvil Junction Railway (No. 1); 39. Brecon and Merthyr Tydvil Junction Railway (No. 2); 40. Brecon and Merthyr Tydvil Junction Railway (No. 3); 41. Brecon and Merthyr Tydvil Junction Railway (Purchase, &c.); 42. Bristol and South Wales Union Railway; 44. Caledonian Railway (Bredisholm and Tannoehside Branch), (Glasgow Harbour Branches); Calne Railway; 45. Carmarthen and Cardigan Railway; Carmarthenshire Railway; 46. Carnarvon and Llanberis Railway (Nos. 1 and 2); 47. Cheadle, Didsbury, and Manchester Railway; 48. Chichester and Midhurst Railway (Nos. 1, 2, and 3)—Board of Trade Reports.

Delivered on 25th February, 1864.

2. East India (Mr. Burgess)—Return.
54. Ionian Islands—Correspondence.
68. Portsmouth Dockyard Extension—Copy of General Plan.
19. Railway and Canal, &c., Bills (49. Chipping Norton and Banbury Railway; Clyde Navigation Railway; 50. Corris Railway or Tramroad; 51. Crystal Palace and South London Junction Railway; 52. Denbigh Valley Railway; 53. Dover, Deal, and Sandwich Railway; 54. Drayton Junction Railway; 55. Dublin and Meath Railway; 56. Dublin, Wick-

